

The Psocoptera (Insecta) of Norfolk and Philip Islands: Occurrence, Status and Zoogeography

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This paper provides a list of the twenty-one species of Psocoptera known from Norfolk Island (29°04'S, 167°56'E) and nearby Philip Island, in the South Pacific, with records of localities, wider distributions and notes on habitat preferences. Their status as widespread species, species known from geographically adjacent areas or island endemics is noted. Local distributions are briefly discussed as a base line for future monitoring of the fauna. Conditions are expected to undergo rapid change on Philip Island resulting from environmental management practices as vegetation regenerates following removal of introduced mammals which had almost completely denuded the island of vegetation. Possible source areas for non-endemic species are suggested. The relationships of the eleven probably endemic species seem to lie with the faunas of the New Zealand subregion, New Caledonia and Australia rather than with Lord Howe Island. The affinities of four endemic species are not clear.

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INTRODUCTION

Psocoptera (commonly known as psocids, booklice or barklice) are usually small insects, 1–10 mm in length, mostly winged as adults, which occur in a variety of habitats, on bark and leaves, in ground litter, in stored products and domestic situations. They feed on fungi, algae, lichens and other elements of the microflora, some species being general feeders while others are specialists with a narrow range of acceptable habitats and food sources.

Hawkins (1943) was the first to record Psocoptera from Norfolk Island when he gave family or generic determinations for a few specimens in the British Museum. Between 1967 and 1972 one of us (CNS) paid several visits to the island, with two of us (CNS, IWBT) visiting in 1971. Study of the accumulated material resulted in a record of fourteen species from Norfolk and Philip Islands, eleven of which were previously undescribed. A fifteenth was added on the basis of material collected by Mrs Marge Jowett (Smithers and Thornton 1974). Another species (*Ectopocus richardsi* (Pearman)) was added from an unusual source, the result of examination of the stomach contents of a gecko, *Phyllodactylus guentheri* Boul., from Philip Island (Smithers 1980). A substantial collection made in 1977 by Dr G.B. Monteith, of the Queensland Museum, included all but four of the previously recorded species, and localities recorded from this material were included, with a key to species, in Smithers (1981). An even larger collection, made by entomologists from the Australian National Insect Collection, Canberra, in 1984, resulted in two further species being recorded from Norfolk Island and one from Philip Island (Smithers 1986), bringing the number of species from the islands to nineteen. A remarkable, almost colourless, previously undescribed, prognathous species was collected from the crown of a

Kentia palm by Mr. N. Tavener in 1986 (Smithers 1994). Intensive collecting of Psocoptera on Norfolk and Philip Islands by two of us (CNS, JVP) between the 12th and 25th January, 1998 resulted in a collection which included all but five of the previously recorded species and in the addition of only one widespread tropical species, bringing the total number now known to twenty-one. Records of Norfolk and Philip Island Psocoptera are included in Smithers (1996) and a list of the Psocoptera recorded up to the end of September, 1996 is included in a catalogue of insects recorded from Norfolk Island (Smithers 1998).

Pigs, goats and rabbits were introduced onto Philip Island during an early period of human settlement on Norfolk Island, resulting in almost complete denudation of Philip Island. Goats and pigs eventually died out. Rabbits survived and only through a long and energetic, not to mention sometimes risky, program of extermination by personnel of the National Parks and Wildlife Service and some of the island's residents were they finally eliminated in February, 1988.

Since the earliest collections and publications on Norfolk Island Psocoptera there have been considerable changes of consequence to fauna and flora conservation on the two islands. Fundamental to these changes has been the long-awaited establishment of the Norfolk Island National Park and the formal environmental protection of Philip Island as well as selected areas of Norfolk. Programs involving deliberate rehabilitation of native vegetation have been initiated. Some results of this activity are apparent on Norfolk Island and some obvious natural revegetation of Philip Island has already taken place. Removal of rabbits has permitted gradual regeneration of plant cover and two species of plants, *Elymus multiflorus* var. *kingianus* (Endl.) Connor (Poaceae) and *Abutilon julianae* Endl. (Malvaceae), both thought to be extinct on Philip, have been rediscovered there (Green 1994). It is hoped that the revegetation processes will continue and that many microhabitats that were lost will be restored and become available for recolonisation by native species of insects.

LIST OF SPECIES OF PSOCOPTERA RECORDED FROM NORFOLK AND PHILIP ISLANDS

The following list gives localities from which each species has been taken (data from all collections), their known distribution beyond Norfolk and Philip Islands, and which species are probably endemic. In the list **PI**=Philip Island, **NI**=Norfolk Island and an asterisk indicates previously unrecorded localities. Where the name of the island is in inverted commas specimens exist which are labelled with the name of the island only as the locality. There has been no detailed study of the ecology of any of the species on Norfolk or Philip, but the list indicates what appear to be their preferred habitats, based on collecting experience and some limited references in the literature for other areas. Some of the locality records are based on trap catches, e.g. Malaise traps and pan traps, and do not provide ecological information. Data on habitat preference may need modification if more detailed habitat studies are carried out.

LEPIDOPSOCIDAE

Echmepteryx madagascariensis (Kolbe)

NI: Duncombe Bay Road*, Steel's Point*. **Wider distribution:** A very widespread species. Known from Madagascar, Africa, Chagos Archipelago, Hong Kong, North America, West Indies, Chile; widespread through the Pacific, New Zealand, Australia, Indonesia. **Habitat:** Frequently found on dried leaves of bananas. This was the only unrecorded species to be taken in the most recent field work.

Lepolepis graemei Smithers and Thornton

NI: Anson Bay Reserve*, Bullock's Hut Road*, Burnt Pine*, Duncombe Bay*, King Fern Gully*, Lion Rock*, Mount Pitt Reserve*, Palm Glen*, Red Road*, Red Road Track*, Rocky Point Reserve*, South Spur Track*, Steel's Point*. **PI:** "Philip Island", Rocky Valley*, Upper Long Valley*, Moo-oo Beach*. **Wider distribution:** Lord Howe Island*. **Habitat:** Mainly an inhabitant of leaf litter; has been taken from dead leaves on trees.

Pteroxanium ralstonae Smithers and Thornton

NI: Burnt Pine*, Collin's Head, Highlands Guest House*, Mount Pitt Reserve*. **Wider distribution:** None recorded, endemic. **Habitat:** On tree trunks, branches and in leaf litter. The least common of the three species of *Pteroxanium*; not taken in the most recent collections.

Pteroxanium evansi Smithers and Thornton

NI: Bumbora, Collin's Head, Mount Pitt Reserve, Point Blackbourne, Point Hunter Reserve, Rocky Point Reserve, Selwyn Reserve, Stockyard Creek. **PI:** "Philip Island", South east slopes*. **Wider distribution:** None recorded, endemic. **Habitat:** On tree trunks, branches and in leaf litter.

Pteroxanium insularum Smithers and Thornton

NI: Anson Bay Reserve*, Botanic Gardens*, Broken Pine Track*, Burnt Pine, Captain Cook Monument, Cascade-Red Road, Collin's Head, Jonneniggabunnet, Highlands Guest House*, Melanesian Mission, Mission Road, Mount Pitt Reserve, Palm Glen, Pitt-Bates Track, Point Blackbourne, Point Ross, Red Road Track*, Rocky Point Reserve*, Selwyn Pine Road, Selwyn Reserve*, Stockyard Creek, South Spur Track*. **PI:** "Philip Island", Lower Long Valley*, Upper Long Valley, South east slopes*, Red Terraces*, Rocky Valley*, Spin Beach*. **Wider distribution:** None recorded, endemic. **Habitat:** On twigs and branches of trees. Has been taken from under a stone. The commonest of the three species of *Pteroxanium* on *Araucaria* but not restricted to it.

TROGIIDAE

Cerobasis guestfalica (Kolbe)

PI: "Philip Island", Upper Long Valley*. **Wider distribution:** A very widespread species. Europe, North America, West Indies, Brazil, Argentina, Chile, Morocco, South Africa, Mauritius, Australia, Tasmania, Java, Hawaii, Robinson Crusoe Island, Azores, St. Helena, Canary Islands, St. Paul Is. **Habitat:** Occurs on bark of trees, coastal dune vegetation, in leaf litter, on fences and sometimes in buildings.

Lepinotus patruelis Pearman

NI: Broken Pine Track, Rocky Point Reserve. **Wider distribution:** A very widespread species. Europe, North America, Argentina, South Africa, New Zealand, Australia, Tasmania. **Habitat:** Occurs in buildings, in stored products, in termite nests, on twigs and branches of shrubs and trees.

Trogium evansorum Smithers

NI: Indoors, Colonial Hotel, Queen Elizabeth Avenue*. **Wider distribution:** None recorded, endemic. **Habitat:** Previously known only from the crown of a *Kentia* palm tree on Norfolk Island.

CAECILIUSIDAE

Caecilius insulatus Smithers and Thornton

NI: Bumbora, Captain Cook Monument, Cascade-Red Road, Mission Road, Point Blackbourne, Rocky Point Reserve, Selwyn Reserve. **Wider distribution:** None recorded, endemic. **Habitat:** Leaf dweller; beaten from both fresh and dead leaves, possibly also living on twigs.

Caecilius pacificus Smithers and Thornton

NI: Ball Bay*, Botanic Gardens*, Bullock's Hut Road*, Bumbora, Burnt Pine, Captain Cook Monument, Collin's Head, Highlands Guest House*, Melanesian Mission, Mount Bates, Mount Pitt Reserve, Nobb's Apartments*, Palm Glen, Point Ross, Rocky Point Reserve, Selwyn Pine Road, Selwyn Reserve, Stockyard Creek. **PI:** Moo-oo Beach*, Upper Long Valley*, "Philip Island". **Wider distribution:** None recorded, endemic. **Habitat:** Inhabitant of smooth, evergreen leaves.

ECTOPSOCIDAE

Ectopsocus briggsi McLachlan

NI: Anson Bay*, Botanic Gardens*, Bullock's Hut Road, Burnt Pine, Captain Cook Monument, Melanesian Mission, Mount Bates, Mount Pitt Reserve, Pitt-Bates Track, Palm Glen, Red Road Track, Rocky Point Reserve, Selwyn Pine Road. **Wider distribution:** Worldwide, likely to be found wherever habitat is suitable. **Habitat:** Lives on dead, dry leaves in litter and especially those hanging from woody plants.

Ectopsocus inornatus Smithers and Thornton

NI: Captain Cook Monument, Mount Pitt Reserve, Palm Glen, Rocky Point Reserve*, Red Road Track*, Botanic Gardens*. **Wider distribution:** None recorded, endemic. **Habitat:** Lives on dried leaves, including those of dead herbaceous plants, and in dead flowers and inflorescences.

Ectopsocus insularis Smithers and Thornton

NI: Anson Bay, Botanic Gardens*, Bullock's Hut Road*, Bumbora, Burnt Pine, Captain Cook Monument*, Collin's Head*, Filmy Fern Walk*, Melanesian Mission, Nobb's Apartments, Rocky Point Reserve, Selwyn Pine Road*, Selwyn Reserve*, Steel's Point*. **PI:** "Philip Island", North Coast*, Moo-oo Beach*, Upper Dykes*, Upper Long Valley*, Whitewood Valley*. **Wider distribution:** None recorded, endemic. **Habitat:** Lives on dead, dry leaves and found in leaf litter.

Ectopsocus richardsi (Pearman)

PI: "Philip Island". **Wider distribution:** Europe (introduced, in stored products), West Africa, Azores, Madagascar, North America, South America, Hong Kong, Australia, Galapagos, Hawaii. **Habitat:** In stored products; in the field in dead inflorescences.

PERIPSOCIDAE

Peripsocus milleri (Tillyard)

NI: Anson Bay Reserve, Botanic Gardens*, Collin's Head*, Mount Pitt Reserve, Nobb's Apartments, Palm Glen, Pitt-Bates Track*, Rocky Point Reserve, Steel's Point*.

PI: "Philip Island", Upper Long Valley. **Wider distribution:** Europe, Canary Islands, Azores, North America, Chile, Australia, Tasmania, Kermadecs, Auckland Islands, New Zealand, Hawaii, Robinson Crusoe Island. **Habitat:** On stems, branches and twigs of shrubs and trees.

Peripsocus norfolkensis Smithers and Thornton

NI: Anson Bay Road, Botanic Gardens*, Bullock's Hut Road*, Burnt Pine, Captain Cook Monument, Collin's Head, Filmy Fern Walk*, Highlands Guest House* Jonneniggabunnit, King Fern Gully* Melanesian Mission, Mission Road, Mount Bates, Mount Pitt Reserve, Norfolk Island National Park, Pitt-Bates Track* Palm Glen, Point Ross, Red Road Track* Rocky Point Reserve, Selwyn Pine Road, Selwyn Reserve, South Spur Track* Steel's Point* Stockyard Creek. **PI:** "Philip Island", Upper Long Valley*. **Wider distribution:** None recorded, endemic. **Habitat:** On twigs and branches of trees and shrubs.

PSEUDOCAECILIIDAE

Heterocaecilius variabilis Smithers and Thornton

NI: Botanic Gardens* Bullock's Hut Road* Bumbora, Burnt Pine, Captain Cook Monument, Highlands Guest House* Mount Pitt Reserve, Nobb's Apartments, Palm Glen, Pitt-Bates Track* Red Road Track* Rocky Point Reserve, Selwyn Pine Road, Selwyn Reserve*. **Wider distribution:** None recorded, endemic. **Habitat:** On green foliage of mainly large shrubs and trees.

PHILOTARSIDAE

Haplophallus emmus Smithers and Thornton

NI: Captain Cook Monument, Mount Pitt Reserve, Rocky Point Reserve, Ross Point. **Wider distribution:** None recorded, endemic. **Habitat:** On mature twigs and branches of trees, bark of Eucalypts.

ELIPSOCIDAE

Propsocus pulchripennis (Perkins)

PI: Moo-oo Beach, Upper Long Valley. **Wider distribution:** Africa, Chile, Mexico, Tasmania, Australia, New Zealand, Hawaii. **Habitat:** Inhabitant of dried leaves and especially of leaf litter.

PSOCIDAE

Blaste lignicola (Enderlein)

NI: Anson Bay Reserve*, Botanic Gardens*, Bumbora, Burnt Pine, Collin's Head*, Highlands Guest House*, Melanesian Mission, Middlegate, Mount Pitt Reserve, Nobb's Apartments, Palm Glen, Rocky Point Reserve, Ross Point, Selwyn Pine Road. **Wider distribution:** Australia, Tasmania. **Habitat:** On trunks and branches of trees and shrubs bearing lichen and algae.

MYOPSOCIDAE

Myopsocus australis (Brauer)

NI: Anson Bay Reserve*, Burnt Pine, Cascade, near Collin's Head*, Point Blackbourne. **Wider distribution:** Australia, Tasmania, New Zealand, Lord Howe

Island, Kermadecs, Solomon Islands. **Habitat:** On trunks and branches of trees carrying fungi attacking bark. Also found on weathered paling fences.

DISTRIBUTION OF NORFOLK ISLAND PSOCOPTERA

Table 1 summarises the known distribution of species between Philip and Norfolk islands and indicates which species are considered to be endemic.

Jones and McDougall (1973) discuss the geological history of Philip and Norfolk Islands, providing a background against which the origins of the fauna can be considered. Holloway (1977), in an outstanding and scholarly treatment of the Lepidoptera of Norfolk Island based on a trapping program carried out by Mrs Mauge Jowett, has summarised this history. An essential point is that the Norfolk Island area was at one time below sea level. From this it is concluded that all elements of the Norfolk land biota are probably derived from transoceanic arrivals during about the past 2.3 million years, the nearest source areas being Australia, New Caledonia, Lord Howe Island and the New Zealand subregion.

When considering the wider geographical distribution of Norfolk Island Psocoptera they can be grouped into three categories.

1. Species which are widespread beyond Norfolk and Philip Islands.

These are species which appear to be highly vagile and have an ability to establish themselves with relative ease, probably because of the widespread availability of suitable habitats in newly colonised areas and, in some cases at least, with the assistance of people. These species, which may have arrived early or recently, are now widespread on Norfolk and Philip. *E. madagascariensis* is closely associated mainly with dead banana leaves, a habitat available almost throughout the tropics. People, by taking bananas from island to island, have probably made suitable habitat more widely available than it would otherwise have been to naturally colonising individuals and have also physically assisted in their dispersal by carriage on leaf material. *C. guestfalica* and *L. patruelis* are found in buildings and have also undoubtedly been introduced into many countries with widely differing climatic regimes. In many of the areas in which they occur they do, however, occupy a wider range of habitats than those provided in domestic situations. They appear not to be specialists in regard to habitat requirements. It is surprising that *C. guestfalica* has been taken on Philip Island but not yet on the larger Norfolk Island where human habitation has been available for so long. *E. briggsi* is almost a worldwide species which usually inhabits dead glabrous leaves of woody, dicotyledonous plants, a habitat which, although somewhat ephemeral, is constantly replaced. In addition to dispersal by natural mechanisms their spread may have been assisted through the introduction of horticultural and possibly packaging material, such as straw. On Philip Island *E. richardsi* has been found only in the stomach contents of a gecko. Elsewhere, it is usually found in stored grains and other stored products but in the field occurs in dead inflorescences. Introduction in grain or dead plant material could easily have assisted its dispersal, with populations maintaining themselves in stored products in the colder climates in which it has also been found. In Britain it has been found in stored cacao imported from West Africa, from where it has also been recorded. *P. milleri* occurs on twigs and branches of trees and appears also to be almost worldwide. It has the same status on twigs and branches as *E. briggsi* does on leaves. *P. pulchripennis* is an inhabitant of dead leaves and leaf litter. It is interesting to note that *P. pulchripennis* does not often occur with species of *Ectopsocus*, such as *E. briggsi*, which are the most frequently encountered species specialising in the use of the same habitat. This is probably because of subtle differences in habitat requirements, but relatively little is known of such factors as specific microfloral components of psocopteran food sources in the wild.

2. Species which are found in limited areas geographically adjacent to Norfolk and Philip Islands.

In addition to Norfolk and Philip Islands, *L. graemei* is known elsewhere only from Lord Howe Island. This Lord Howe Island record has not previously been published. Details of the many specimens taken there in surveys by Dr. T. Kingsston and Dr G. Monteith in 1978 and 1979 will be provided in a forthcoming study of the Psocoptera of Lord Howe Island. Over the years there has been much exchange of vegetable and other material between the islands and there must have been ample opportunity for transfer from one to the other by this means or naturally. There is so far no way of knowing in which direction immigration might have taken place. *Blaste lignicola* has been found only in southeastern Australia and Tasmania and *M. australis* is known elsewhere from Tasmania, New Zealand, Lord Howe Island, Kermadecs and the Solomon Islands. It is very common in western, through southern and southeastern to northeastern Australia. Both species inhabit the bark of trees and by whatever route these two species might have arrived on Norfolk they probably have their origin in Australia. Wind assisted dispersal, as in the case of many species of Australian insects arriving in New Zealand (Tomlinson, 1973; Fox, 1978; Early et al. 1995 and many references therein), could easily account for the arrival of several of the non-endemics on Norfolk from source areas in Australia, New Caledonia or elsewhere at any time since the last exposure of Norfolk by lowering of sea level about 2 million years ago (Holloway, 1977). A high proportion of the non-endemics of Norfolk are found in the New Zealand subregion.

3. Species so far found only on Norfolk and Philip Islands.

Eleven species are considered at present to be endemics, a high percentage of the known fauna. Five of these are known to occur on both islands (*P. evansi*, *P. insularum*, *C. pacificus*, *C. insulatus*, *P. norfolkensis*). The remaining six endemics are known from Norfolk only (*P. ralstonae*, *T. evansorum*, *E. insularis*, *E. inornatus*, *H. variabilis*, *Hap. emmus*). There are no endemics known only from Philip.

AFFINITIES OF ENDEMIC ELEMENTS OF THE FAUNA

The probable affinities of the endemic species are summarised in the following list. Apparent near relatives are known to occur in the areas given for each species. Comparisons are based on limited knowledge of several of the families in such areas as New Caledonia and it should be noted that the fauna of Lord Howe Island is not yet as well known as that of Norfolk.

- P. evansi*: Chatham Islands
- P. insularum*: Chatham Islands
- P. ralstonae*: Chatham Islands
- C. pacificus*: New Zealand, Australia
- C. insulatus*: New Zealand, Australia
- P. norfolkensis*: Australia, New Caledonia
- T. evansorum*: ?
- E. insularis*: Philippines, Samoa, Micronesia
- E. inornatus*: ?
- H. variabilis*: ?
- Hap. emmus*: Lord Howe Island, Australia, New Zealand, New Caledonia

Six species of the Norfolk endemics seem to have affinities with the New Zealand subregion, two with New Caledonia, four with Australia, one with other Pacific island

groups and one with Lord Howe. The affinities of three species are not clear. Seven of the eleven endemics have relatives in areas lying on the Norfolk Ridge. Ties with Lord Howe Island seem limited, through one species only (*H. emmus*) other than *L. graemei*, the only shared species, which could have originated on either island. On balance it appears that the New Zealand subregion has had the greatest influence in providing the source of endemic species on Norfolk and could well be the area from which several of the more widespread non-endemics have come. This is interesting in light of the fact that moths regularly or sporadically immigrant into New Zealand and Norfolk Island are predominantly of Australian origin (Holloway 1977).

DISTRIBUTION OF SPECIES BETWEEN NORFOLK AND PHILIP ISLANDS

Out of a total of 21 species of Psocoptera, 18 have been recorded from Norfolk Island and ten from Philip Island. Eleven species have been found on Norfolk which have not been found on Philip and there are 3 known from Philip but not yet found on Norfolk. Not one of these (*C. guestfalica*, *E. richardsi*, *P. pulchripennis*) is endemic, all three being widespread in other parts of the world.

Considering the 5 non-endemics which have not been found on Philip, *E. madagascariensis* (on dead banana leaves), *L. patruelis* (brachypterous mostly in human habitation), *E. briggsi* (mainly on dead leaves) and *B. lignicola* and *M. australis* (associated with lichens and algae or fungus on trunks and branches of trees), it is possible that these species have not yet been found on Philip because of current lack of narrow niche requirements in the habitat. *E. briggsi*, however, is a surprising absentee from Philip because its habitat is available, especially since the gradual revegetation of the island has been in progress. Dead leaves form a habitat which is continuously being replenished and so is always available for colonization by *E. briggsi* and other species which prefer it.

Although it can never be known with certainty how many, and which, species were originally on Philip, it seems highly unlikely that the six endemics on Norfolk Island not yet recorded from Philip were not present there prior to the almost total destruction of vegetation of Philip which resulted from introduction of herbivorous mammals. Norfolk Island has an area of about 34 square kilometres and rises to a height of over 300 metres at Mt Pitt (316 m) and Mt Bates (308 m). Philip Island, which is much smaller, covers about 2 square kilometres and is about 280 metres at its highest point. Although differing considerably in size, the two islands, at about 6.5 km apart, are very close to one another. The vegetation on Philip may never have been as dense as that on Norfolk and by 1830 it had certainly been reduced enough to permit some obvious erosion (Green 1994). The island must, however, have been at one time (prior to human influence) substantially clothed in forest, enough to prevent erosion and support the development and maintenance of forest communities which included large trees such as *Araucaria heterophylla* (Salisb.) Franco (Norfolk Island Pine) (Araucariaceae) and *Lagunaria patersonia* (Andrews) G. Don. (White Oak) (Malvaceae) as well as other endemic and indigenous species. Interchange of insects between the islands would have been, and must still be, frequent. It seems likely that the "missing" endemics disappeared as a result of the denudation and loss of suitable habitat rather than that they were never present. Possibilities for interchange have not diminished. Despite the presence of substantial populations on Norfolk which could serve as a source of recolonisers of "missing" endemics, six of them have not, apparently, so far reestablished themselves in response to the present increasing levels of revegetation. Adequate niche features of the habitats required by them may, of course, still not be available on Philip.

Now that substantial collections of Psocoptera have been made on the islands between 1967 and 1998, the fact that only one species, a pantropical inhabitant of dead banana leaves, was added in the intensive recent field work strongly suggests that most

of the species have probably been recorded. It would be useful to be able to quantify the collecting effort which has been put into Psocoptera collection over time. Unfortunately, although some of the collections were made by specialist collectors concentrating on the group continuously for a known number of days, several of the collections have been the result of general trapping programs undertaken for various periods, and a few species have been added through casual collecting. It is, therefore, not possible to produce a meaningful discovery curve. It is, however, timely to provide this summary of present knowledge in the hope that subsequent reestablishment and turnover of species will be more easily followed and documented.

It will be interesting to see if, and when, recolonisation of Philip by the presumably "lost" endemics and other species "missing" from Philip, but present on Norfolk, takes place. Frequent, long term, detailed monitoring of vegetational changes and reestablishment of Psocoptera (and other insect groups) on the island could be instructive in giving an insight into the processes of recolonisation by a partially eliminated fauna during a period of reestablishment of vegetation.

At the same time it should be noted that Norfolk has an area of just under 35 square kilometres and supports 18 recorded species of Psocoptera. Philip Island, with an area of about 2 square kilometers apparently supports 10 species. Considering the small areas involved and small numbers of species recorded these numbers are probably tolerably close to the expected relative number of species in terms of the Equilibrium Theory of Island Biogeography. Perhaps Philip Island is already at maximum expected "carrying capacity" and little long term increase should be expected.

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TABLE 1.
Psocoptera recorded from Norfolk and Philip Islands

SPECIES (E = Species probably endemic to Norfolk/Philip Islands — 11 species)	NORFOLK ISLAND		PHILIP ISLAND	
	Earlier records	In 1998 material	Earlier records	In 1998 material
LEPIDOPSOCIDAE				
<i>Echmepteryx madagascariensis</i>		X		
<i>Lepolepis graemei</i>	X	X	X	
<i>Pteroxanium evansi</i> E	X	X	X	X
<i>Pteroxanium insularum</i> E	X	X	X	X
<i>Pteroxanium ralstonae</i> E	X			
TROGIIDAE				
<i>Cerobasis guestfalica</i>			X	X
<i>Lepinotus patruelis</i>	X			
<i>Trogium evansorum</i> E	X	X		
CAECILIUSIDAE				
<i>Caecilius insulatus</i> E	X	X		
<i>Caecilius pacificus</i> E	X	X	X	X
ECTOPSOCIDAE				
<i>Ectopsocus briggsi</i>	X	X		
<i>Ectopsocus inornatus</i> E	X	X		
<i>Ectopsocus insularis</i> E	X	X	X	X
<i>Ectopsocus richardsi</i>			X	
PERIPSOCIDAE				
<i>Peripsocus milleri</i>	X	X	X	X
<i>Peripsocus norfolkensis</i> E	X	X	X	X
PSEUDOCAECILIIDAE				
<i>Heterocaecilius variabilis</i> E	X	X		
ELIPSOCIDAE				
<i>Propsocus pulchripennis</i>			X	
PHILOTARSIDAE				
<i>Haplophallus emmus</i> E	X	X		
PSOCIDAE				
<i>Blaste lignicola</i>	X	X		
MYOPSOCIDAE				
<i>Myopsocus australis</i>	X			
Total numbers of species	17	15	10	7
Total numbers of species	18	10		
Total number of species	21			